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Review Paper on Network Topology

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Introduction

When two or more devices are connected to each other through connecting links, then it is known as a network. Network topology describes the layout or appearance of a network that is, how the computers, cables, and other components within a data communication network are interconnected, both physically and logically.

Physical Topology means the physical design of a network including the devices, location and cable installation. Logical Topology refers to the fact that how data actually transfers in a network as opposed to its design.

Some of the network common network topologies are:

Bus Topology

A bus topology is commonly used for local area network. It is a multipoint data communication circuit. A single network cable runs in the whole network and all nodes are linked along with this communication line with two endpoints called the bus or backbone. When the network installation is small, simple or temporary, bus topology is used for the network. The speed of bus topology is slow because only one computer can send a message at a time.

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Advantages of Bus topology:

(i) It is easy to understand and install.
(ii) Requires least amount of cable to connect the computers (nodes) together and therefore is less expensive than other cabling arrangements.
(iii) It's easy to extend, two cables can be easily joined with a connector, making a longer cable for more computers to join the network.
(iv) In expansion, repeaters can be used to boost the signal and increase the distance.

Disadvantages of Bus Topology:

(i) Heavy network slows down the bus speed.
(ii) The connector used for expansion of the bus attenuates the signal considerably.
(iii) The bus configuration can be difficult to find and can cause the whole networks to stop functioning.

Ring Topology

This is another structure for local area network. In this, cables runs from one computer to another until all the computers are connected in the form of a loop or ring. Last computer is connected to the first computer. There is a point to point connection between the two neighbouring computer. This topology is unidirectional. The data is transferred in a sequential manner bit by bit around the ring. Each packet of data sent to the rink is prefixed by the address of the station to which it is being sent. When a packet of data arrives, the node checks to see if the packet address is the same as its own, if it is, it grabs the data in the packet. If the packet does not belong to it, it sends the packet to the next node in the ring.

The most common implementation of this topology is token ring. A break in the ring causes the entire network to fail. Individual nodes can be isolated from the ring.

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Advantages of Ring topology:

(i) Ring networks offer high performance for a small number of workstations or for larger networks where each station has a similar workload.

(ii) Ring networks can span longer distances than other types of networks.

(iii) Ring networks are easily extendable.

(iv) Unlike Bus topology, there is no signal loss in Ring topology because the tokens are data packets that are re-generated at each node.

Disadvantages of Ring topology:

(i) Relatively expensive and difficult to install

(ii) Failure of one computer on the network can affect the whole network.

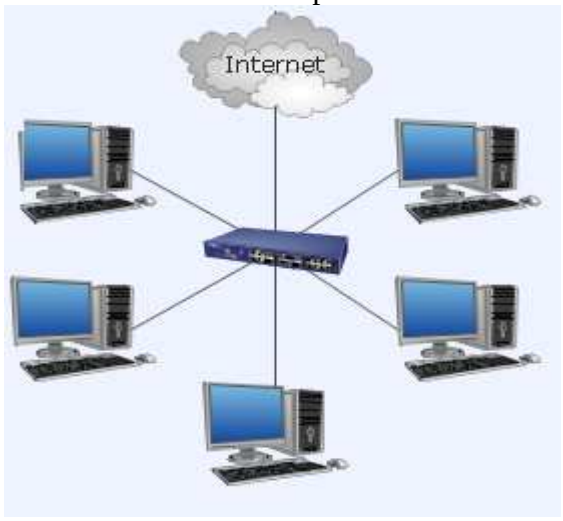
(iii) It is difficult to find fault in a ring network.

(iv) Adding or removing computers can disrupt the network.

(v) It is much slower than an Ethernet network under normal load.

Star Topology

In a star topology, a central hub is used through which all the computers are connected. This is used where the end points are directly reachable from a central location. Nodes communicate across the network by passing data through the hub. A star network uses a significant amount of cable as each terminal is wired back to the central hub, even if two terminals are side by side but several hundred meters away from the host. The central hub makes all routing decisions, and all other workstations can be simple.



Source: Internet

Advantages of Star Topology:

(i) It is more reliable (if one connection fails, it does not affect others)

(ii) The centre of a star network is a good place to diagnose network faults and if one computer fails whole network is not disturbed. Hub detects the fault and isolates the faulty computer.

(iii) It is easy to replace, install or remove hosts or other devices, the problem can be easily detected-It is

easier to modify or add a new computer without disturbing the rest of the network by simply running a new line from the computer to the central location and plugging it to the hub.

(iv) Use of multiple cable types in a same network with a hub.

(v) It has good performance.

Disadvantages of Star Topology:

(i) It is expensive to install as it requires more cable, it costs more to cable a star network because all network cables must be pulled to one central point, requiring more cable length than other networking topologies.

(ii) Central node dependency, if central hub fails, the whole network fails to operate.

(iii) Many star networks require a device at the central point to rebroadcast or switch the network traffic.

Mesh Topology

In Mesh topology, every device has a dedicated point to point link to every other device.

Mesh topologies are used in critical connection of host computers (typically telephone exchanges). Alternate paths allow each computer to balance the load to other computer systems in the network by using more than one of the connection paths available.

A fully connected mesh network therefore has no (n-1) /2 physical channels to link n devices. To accommodate these, every device on the network must have (n-1) input/output ports.

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Advantages of Mesh Topology:

(i) Point to point links make fault diagnose easy.

(ii) It provides security and privacy because every message sent travels along a dedicated line.

(iii) Yield the greatest amount of redundancy in the event that one of the nodes fails where network traffic can be redirected to another node.

Disadvantages of Mesh Topology:

(i) Cabling cost is more.

(ii) The hardware required to connect each link input/output and cable is expensive.

(iii) A large number of I/O (input/output) ports are required.

Tree topology

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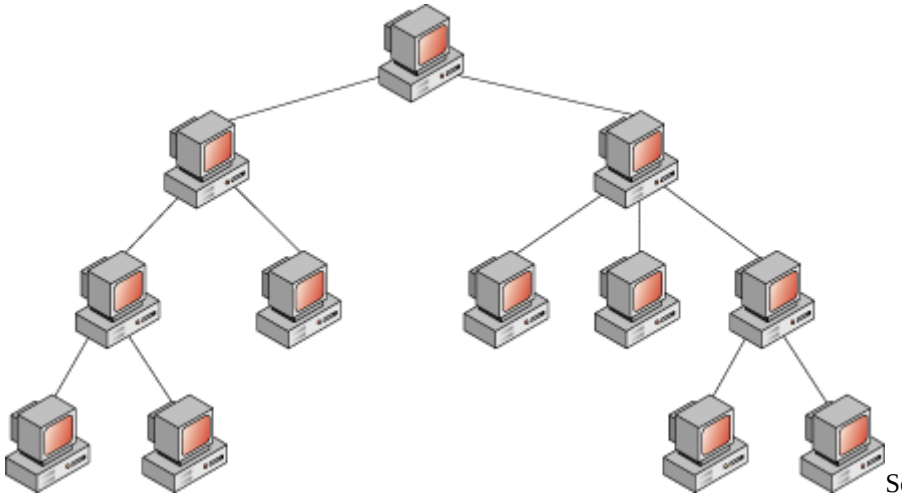
The most common structure or topology known as Tree topology, Tree topology is a LAN topology in which only one route exists between any two nodes on the network. The pattern of connection resembles a tree in which all branches spring from one root.

Tree topology is a hybrid topology, it is similar to the star topology but the nodes are connected to the secondary hub, which in turn is connected to the central hub. In this topology group of star-configured networks are connected to a linear bus backbone.



Source: Internet

Advantages of Tree Topology:

(i) Installation and configuration of network are easy.
(ii) The addition of the secondary hub allows more devices to be attached to the central hub.
(iii) Less expensive when compared to mesh topology.
(iv) Faults in the network can be detected traces.

Disadvantages of tree Topology:

(i) Failure in the central hub brings the entire network to a halt.
(ii) More cabling is required when compared to the bus topology because each node is connected to the central hub.

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